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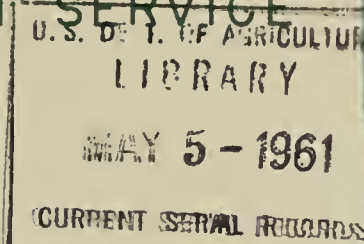


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# TECHNICAL NOTES

LAKE STATES FOREST EXPERIMENT STATION  
U.S. DEPARTMENT OF AGRICULTURE · · FOREST SERVICE

No. 603



Intensity of Soil Moisture Sampling  
Is Affected by Depth and Vegetative Cover<sup>1/</sup>

Soil scientists, agriculturists, and foresters who study soil moisture behavior are faced with a common sampling problem: How many samples are required to give a reasonable estimate of moisture available for plant growth?

This is a complex problem since several factors contribute to differences in soil moisture. One is physical variations in the soil itself. Another is cover. Different cover types affect soil moisture because of the varying size of plants and root systems, which not only affect distribution of precipitation but withdrawal of moisture from the upper soil horizons.

To measure soil moisture changes in a relatively uniform sandy soil profile (Grayling sand in Lower Michigan), a number of soil samples were collected for moisture content under oak cover and in an adjacent open field supporting grass cover. Both study areas, about 1 acre each in size, were sampled at the end of the growing season when the soil moisture was near the wilting point (September 1957) and at the beginning of the growing season when soil moisture was near field capacity (April 1958).

The soil moisture variation under grass and oak as determined by 40 sampling points is shown in table 1. Sampling points were selected systematically at  $\frac{1}{2}$ -chain intervals (33 feet). Inches of moisture are given for the 0-1, 1-2, 2-3, 3-5, and 5-7 foot depths at each sampling point. Moisture contents were determined gravimetrically in the laboratory and converted to inches of water.

Under both cover types, soil moisture variability as expressed by standard deviation showed a general decrease with increasing depth. In the grass plot the surface foot had less variability than the second foot of soil. This may be a result of the uniform occupation of the surface soil by grass roots as compared to a patchy root distribution and variable humus depth in the oak.

Variations in soil moisture are slightly less under grass than forest cover for each depth sampled in both the wet and dry periods. Again, this may be attributable to the more uniform root distribution in grass cover.

It is only reasonable to point out the statistical limitations of this study. Only one plot in each cover type was sampled, and samples were taken only under extremes of wetness and dryness. The variation that may be expected in other plots and under other ranges of soil moisture may be different.

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<sup>1/</sup> This study is one phase of a watershed research project being conducted in cooperation with the Michigan Department of Conservation.

The results indicate that the number of samples needed for an estimate of soil moisture will vary by soil depth and cover crop. Under both cover types more samples are needed in the upper horizons. An oak plot should be more intensively sampled than a grass plot to achieve the same reliability of measurement. Figure 1 indicates that in the first foot of soil about twice as many samples are needed under oak as under grass. At the 5-7 foot depth, only a 25-percent increase in sampling intensity is required.

April 1961

WILLIAM D. STRIFFLER, Research Forester

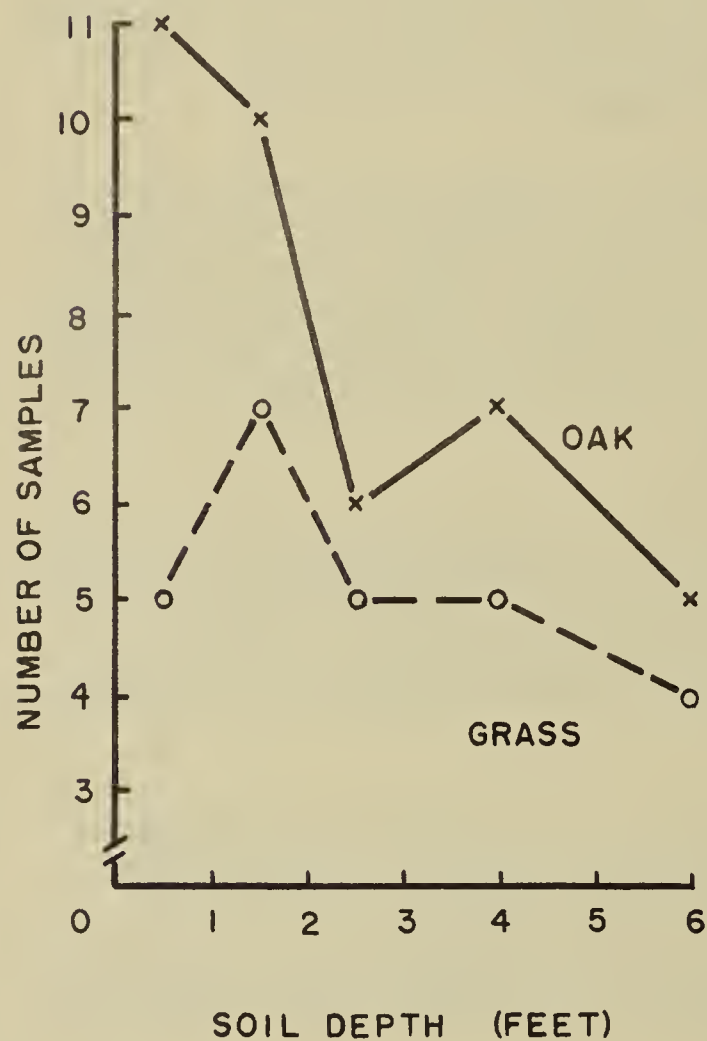


Figure 1.--Sampling frequency adjusted by soil depth to give soil moisture within 0.09 inch of accuracy per foot of soil.

Table 1.--Soil moisture variation under grass and oak during wet and dry periods; measured at 40 sampling points on 1-acre study areas for each type of vegetation  
(In inches of water)

Soil : depth: (feet):	Mixed oak		Grass	
	Mean	:Standard :deviation:	Mean	:Standard :deviation:
May 8 (wet period)				
0-1	1.37	0.15	1.14	0.09
1-2	1.05	.14	1.03	.12
2-3	.78	.11	.76	.08
3-5	.74	.07	.71	.06
5-7	.72	.09	.77	.08
September 19 (dry period)				
0-1	.64	.13	.86	.08
1-2	.43	.11	.43	.12
2-3	.28	.09	.33	.10
3-5	.34	.12	.51	.11
5-7	.40	.10	.56	.09